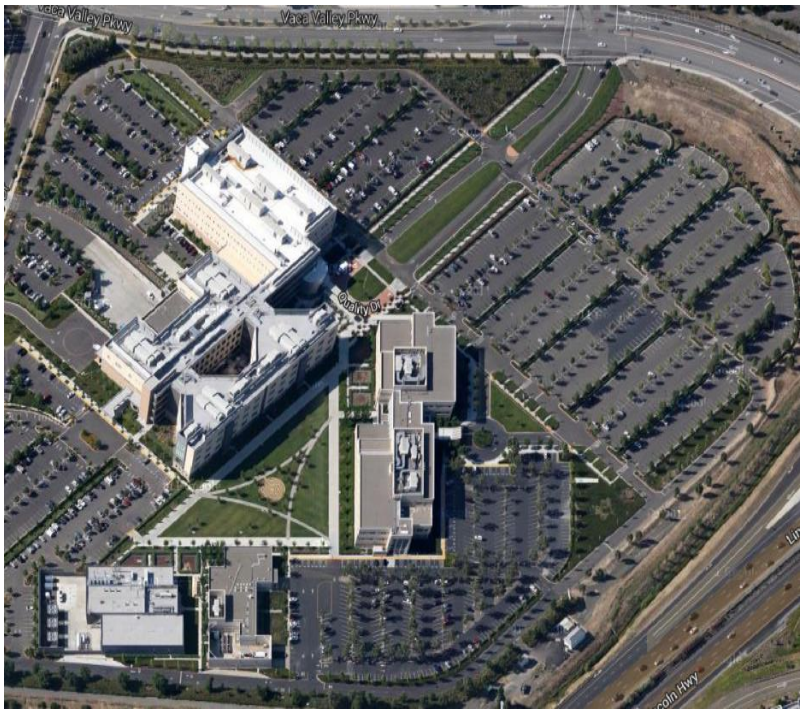
PROJECT PROFILE

Kaiser Permanente Vacaville Medical Center

750-kW Microturbine System



Quick Facts

LOCATION: Vacaville, CA
MARKET SECTOR: Health Sector
FACILITY SIZE: 794,461 square feet, 48 acres
FACILITY PEAK LOAD: 3 MW
EQUIPMENT: 750 kW (Twelve 65-kw Capstone C-65 microturbines with heat recovery)
FUEL: Natural gas
USE OF THERMAL ENERGY: Space heating and hot water
CHP TOTAL EFFICIENCY: 65%
ENVIRONMENTAL BENEFITS: Estimated avoided CO_2 emissions of 1,458 tonnes per year and NO_X avoided 4,600 pounds per year
TOTAL PROJECT COST: $1.7 million
YEARLY ENERGY SAVINGS: $500,000+
PAYBACK: ~2.5 years (with PG&E rebates)
CHP IN OPERATION SINCE: 2009

Site Description

The Kaiser Permanente Hospital, trauma center and medical offices in Vacaville, California, opened in October 2009. The hospital features the latest health science technologies, large and private in-patient rooms and a wide array of medical and health services. The facility has won multiple awards, including the 2013 Energy Star Campus and the 2014 Practice Green Health Award for Environmental Excellence in Energy.

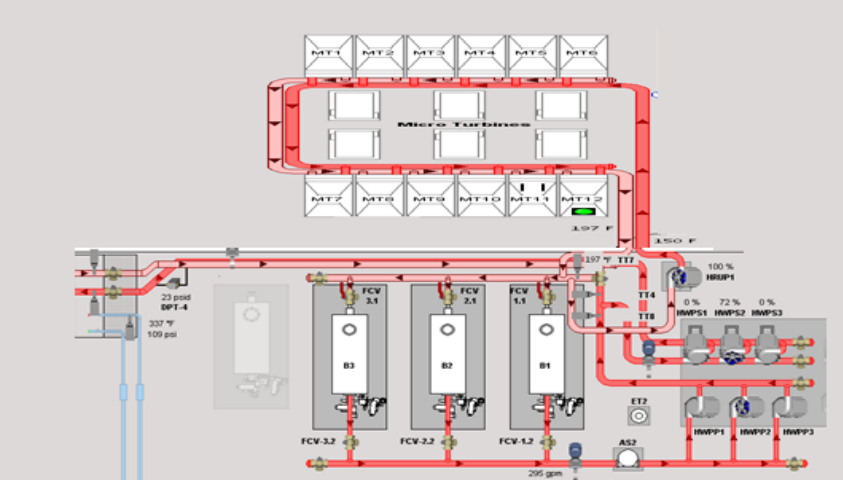
Reasons for CHP

The following are reasons why Vacaville Medical Center chose to adopt CHP:

- High electric demand and high thermal requirements due to 24/7 building occupancy
- Increases power reliability
- Reduces cost paid to utility provider
- Saves money to support other medical center needs

CHP Equipment & Operation

The Vacaville Medical Center combined heat and power (CHP) system includes 12 Capstone 65-kW microturbines for a total of 750 kW of net power generation. The system serves 794,461 square feet of hospital and medical office buildings. The medical center and its power system began full operation since the hospital's opening in October 2009.



Microturbine Generator System
ILLUSTRATION COURTESY OF KAISER PERMANENTE VACAVILLE

The basic premise of CHP is that a natural gas generator is installed to generate electricity within a facility and is supplemented by the utility grid to meet the building electrical load. A heat recovery system is provided to capture microturbine exhaust heat that is then used to heat water for space heating (in the HVAC systems) and domestic hot water.

The generation system is sized based on the minimum or baseload of a facility. That is, the size equal to the load that is present 24 hours a day. That way the system can always be used and is not required to operate at part load, which is less efficient in terms of the amount of natural gas consumed per kilowatt-hour produced.

Based on the Vacaville facility's data, about 65% of the waste heat is recovered from the microturbines and used to replace heating that otherwise would be provided by a boiler. All 12 microturbines operate 24 hours per day, seven days a week. The medical center load is large enough even at low load conditions to support the need for all the turbines.

Financial Incentives

The medical center's monthly electrical energy demand is approximately 3,000 kilowatts (kW). The average local utility cost for power is about $0.11/kWh. Based on minimizing the generator size to accommodate the base or minimum heat load, the combined generator package was sized at 750 kW. Each unit produces approximately 265,000 BTU/hr. of hot water. The maintenance costs are less than $0.015/kWh. The total cost of installation was approximately $1.7 million. At the time the project was purchased, PG&E rebates were available that significantly offset the installation cost. The current annual operating cost savings is approximately $510,000 per year.

Lessons to Share

The facility would like to share the following lessons:

- If the utility provider had been willing to allow high-pressure gas into the property, they could have saved a substantial amount on initial costs and annual maintenance by not installing booster compressors.
- The designer should have allowed three feet of space between each unit to facilitate faster and easier maintenance.

For More Information

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More CHP project profiles:
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